PRI GSM Gateway

Link Gate PRI

User manual v1.0

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Dear customer,
We congratulate you on purchase our product. Our wish is to make you satisfied with the PRI Gate completely and for a long time.

! Important!
Before you start installing this product, check whether the delivery is complete and read this manual thoroughly. The manufacturer cannot be held responsible for any damages that occurred due to incorrect use of this product in contradiction to this manual. The guarantee terms do not cover damages of the product caused by rough handling, incorrect storage or by exceeding the quoted technical parameters.

GSM Gateway *Link Gate PRI* is a compact highly sophisticated system. It supports full remote supervision and configuration via an IP network or USB port. The system has been designed and works with a lot of highly sophisticated functions, which make it fully client-oriented and highly reliable in cooperation with both GSM networks and ISDN. Configuration alterations can be made without resetting, i.e. under full operation.

Basic general features

- Connection to the exchange through ISDN E1 interface with DSS1 signaling or QSIG
- Connection to DTMF extension line through direct dialing
- Connection directly to the operator or the determined line
- Connection to the operator after a time period elapse (adjustable) to select an extension line
- Transfer of the number of the calling subscriber in the exchange (CLIP)
- Limitation of outgoing calls in GSM network
- Limitation of incoming calls from GSM network
- Priority connection through each of GSM module (LCR)
- Setting own time rate by 1 second or only in case of establishing connection
- Selection of the GSM service provider separately for each GSM module
- SIM card protection using PIN
- Detailed gate parameters setting from PC through a program for Windows 98/2000/XP
- Power supply 8-12 V DC

Note: Cross reference are written *cursive (Italic), and underline*.

Description

The system is integrated in a 19“ sub rack of the height of 3U and depth 360 mm. The front side is open, equipped with guides for plug-in boards with front panels.

1 CPU Board Description

The CPU board contains a powerful processor system controlling the whole system. The board is designed on a 4-layer PCB of the size of 280x100mm. CPU board contains also four primary rate (PRI, E1) ISDN interfaces and PCM bus switching and timing circuit. E1-A interface is designed for connection to PBX and LCR functions is activated on this port. E1-B is designed for connection to PSTN and all calls from this port will be routed to E1-A port. Ports E1-C and E1-D are in present time reserved for future applications. Each of these interfaces can be configured as TERMINAL or as NETWORK independently and each of these interfaces can be configured as a input of clock synchronization with defined priority. An USB interface, an Ethernet connector (10/100 Base-T), and four RJ45 connectors with pair of E1 line status LED indicators are located on the front panel.

Description of LED value		
GREEN	**YELLOW**	Description
LIGHT	**DARK**	Connection is OK
FLASH	**DARK**	No datalink connection (Layer 2)
LIGHT	**SOMETIMES FLASH**	Connection is OK, lines is not synchronized (slip)
DARK	**FLASH**	Signal is present but it is not OK
DARK	**LIGHT**	No signal
DARK	**DARK**	Line is not in configuration

LED LAN indicates LAN connection (LED is green – connection is OK, yellow LED flash when LAN is under way).

1.1 RJ45 pin setting

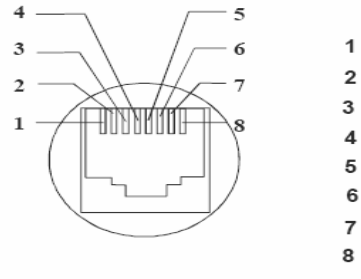


Fig.: contacts of TE connectors

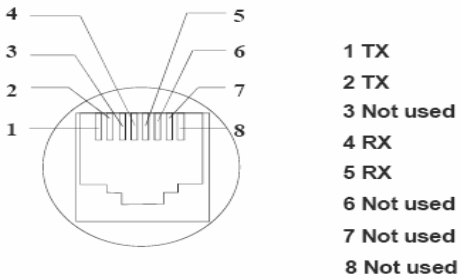
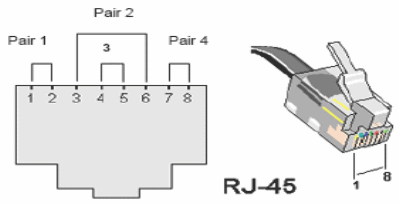


Fig.: contacts of NT connectors



Swapping of the transmitting and receiving connector pair can be made either automaticaly according NT or TE configuration setting or manualy according user setting. For this

selection is not need to switch any jumpers on CPU board – all can be made using ***Link Gate PRI*** configuration software.

2 GSM peripheral Board

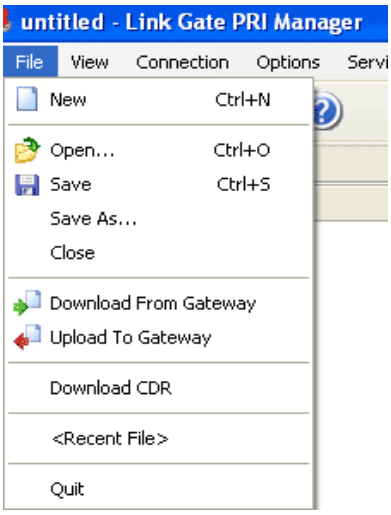
The GSM board contains four GSM modules (Siemens TC35i), circuits for their connection to the PCM bus, and DTMF receivers. The board is designed on a 4-layer PCB of the size of 280x100mm. Four antenna connectors and 4 GSM status indicators are located on the front panel.

Possible statuses of indication LED diodes	
LED Color	Description
GREEN LIGHT	connection in process (call)
GREEN FLASH	module logged in the network, rest condition
RED FLASH	GSM module is not presented
ORANGE FLASH	ERROR

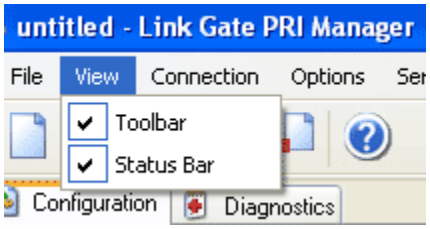
Software

***Link Gate PRI* Configuration**

This program allows you to configure and control your gateway. In top menu you can set all parameters throuth items *File*, *View, Options,* and *Service*. First you install proper interface in menu Option *Interface* to configure other items. Some parameters you can set throuth the use of item in toolbar (*New, Open, Save,Download from Link Gate PRI Link Gate PRI*, and *Upload to*).

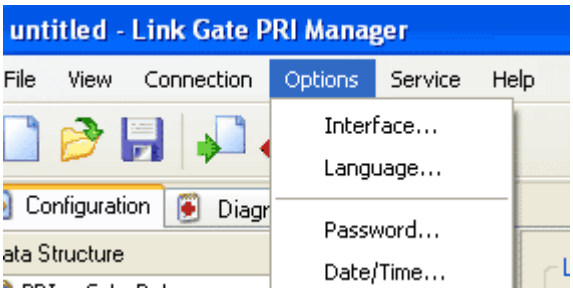


Section File allows you to define New file of configuration and save it as a *.cfg or Open an existing configuration file. After setting configuration you can Save it or Save as. This configurate file you can retain in Upload to . Setting of configuration you can read from the gateway throught item Download from Link *Gate PRI* PRI. You can see recent saved files (max 6) in section Recent file. There is an item for program end too (section Quit).

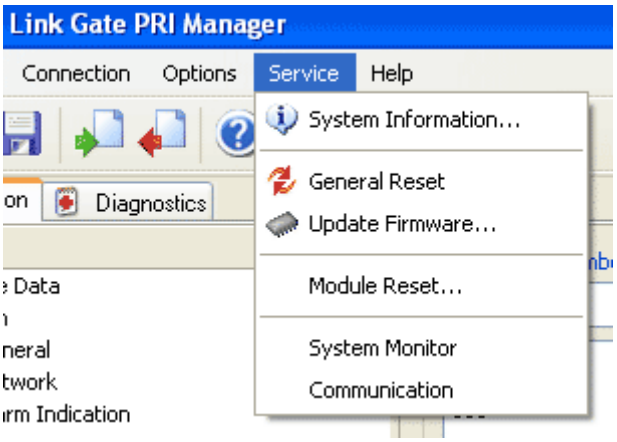


Section *View* allows you to display or not *Toolbar* and *Status* bar.

Section *Options* allows you to set *Interface*, *Password* and *Language*.

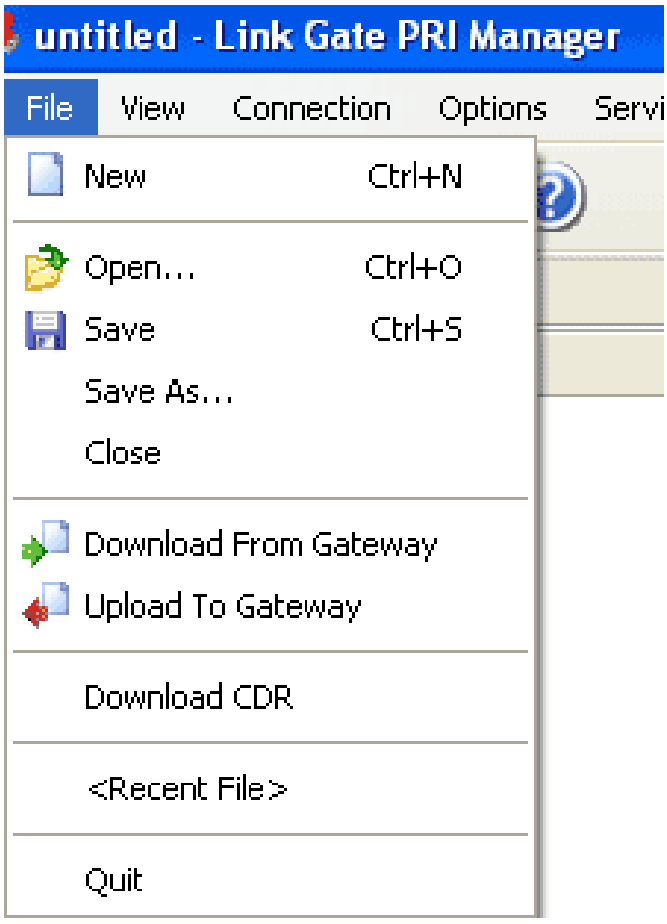


Section *Service* contains commands for the gateway as *Reset*, *Update firmware*, and allows display and *System Monitor* (available only if the ***Link Gate PRI*** is connected).



3 File

Section File allows you to define New File of configuration and save it as a *.cfg or open an existing configuration file. After setting configuration you can save it or upload to gateway. Contains an item for program end too.



3.1 New

In this pane you can create the new configuration and load default setting in the tree and set or change it.

3.2 Open

Program opens a file from a folder selected by you.

3.3 Save

Program saves a file of configuration.

3.4 Save as

Program saves the file into a folder selected by you.

3.5 Close

Terminates setting configuration.

3.6 Download from *Link Gate PRI*

If you extract from Menu File this item you can download last-saved configuration file from gateway.

3.7 Upload to *Link Gate PRI*

This item allows you to save your configuration file to gateway.

3.8 Recent file

There are recent saved files of configuration (last 6).

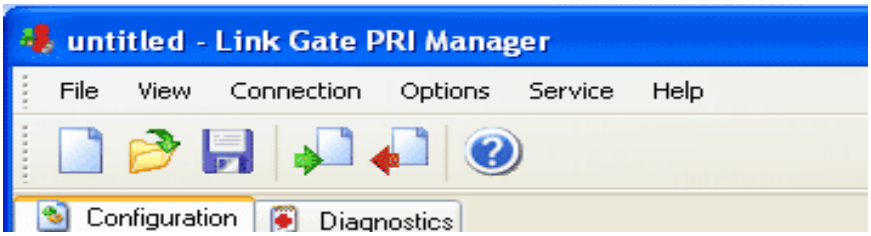
3.9 Quit

Terminates the program.

4 View

4.1 Toolbar

Display or hide toolbar with items *New, Open, Save, Download from Link Gate PRI*, *Upload to* and inofmation about programm.



4.2 Status

Display or hide status line on the bottom of pane.

5 Options

This section is used for setting *Interface*, *Password*, *Language and Date and Time*.

5.1 Interface

Select COM port

Choose proper COM port, which makes communication gateway with your PC.

5.2 Password

You can set or change password for access to gateway. Password is saved in *Link Gate PRI*.

5.3 Language

English.

6 Service

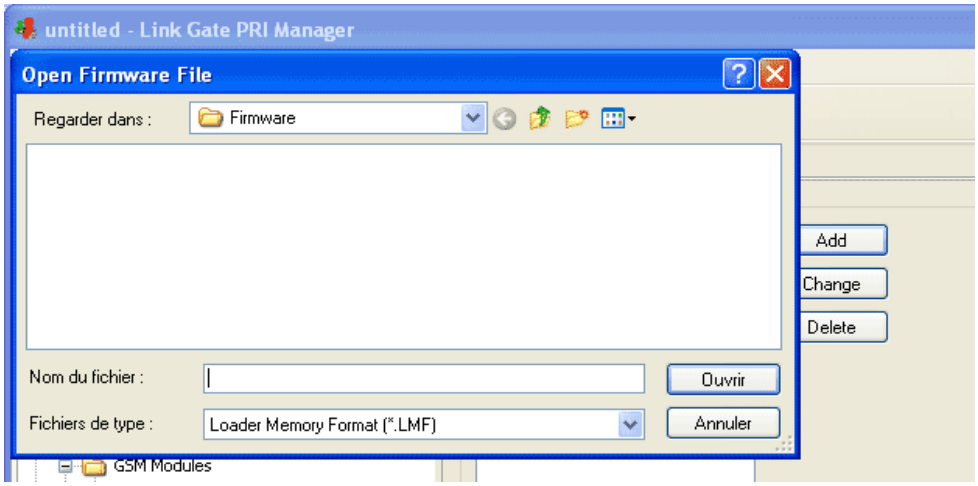
Contains commands for the gateway (available only if the ***Link Gate PRI*** is connected).

6.1 Reset

System restarts the gateway and initializes all Gateway boards (the gateway communication is not discontinued but all current calls and SMS to be sent are terminated!).

6.2 Update firmware

System writes firmware (file *.LMF) into Gateway.

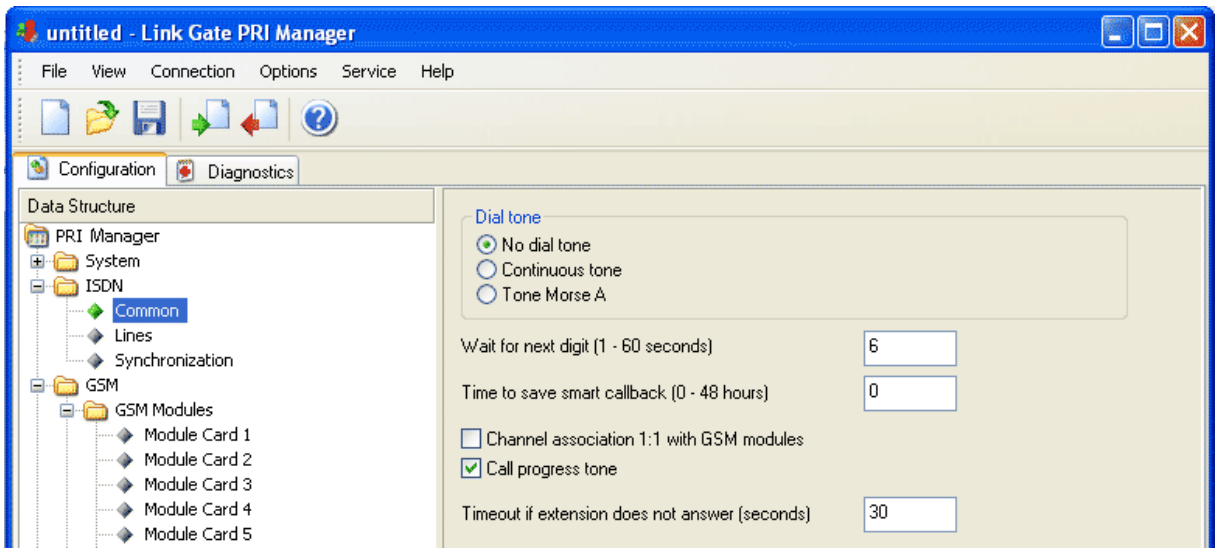


6.3 System Monitor

This pane is used for storing traces from ISDN layers (sending and receiving messages) for possible check in case of problems.

7 *Configuration*

In the bookmark of Configuration you can set Link Gate PRI gateway parameters as



ISDN,

ISDN

This pane contains setting of ISDN line. You can set *Common* properties, options for each line and *Synchronization.*

7.1.2 Common

- **Dial tone**

No dial tone

Gateway will not send any dial tone towards PBX on empty SETUP (in case that receive SETUP message without called party number).

Continuous tone

Gateway sends continuous dial tone.

Tone Morse A

Selection of type of dial tone (330 ms pulse, 330 ms pause, 660 ms pulse, 660 ms pause).

- **Wait for dialing**

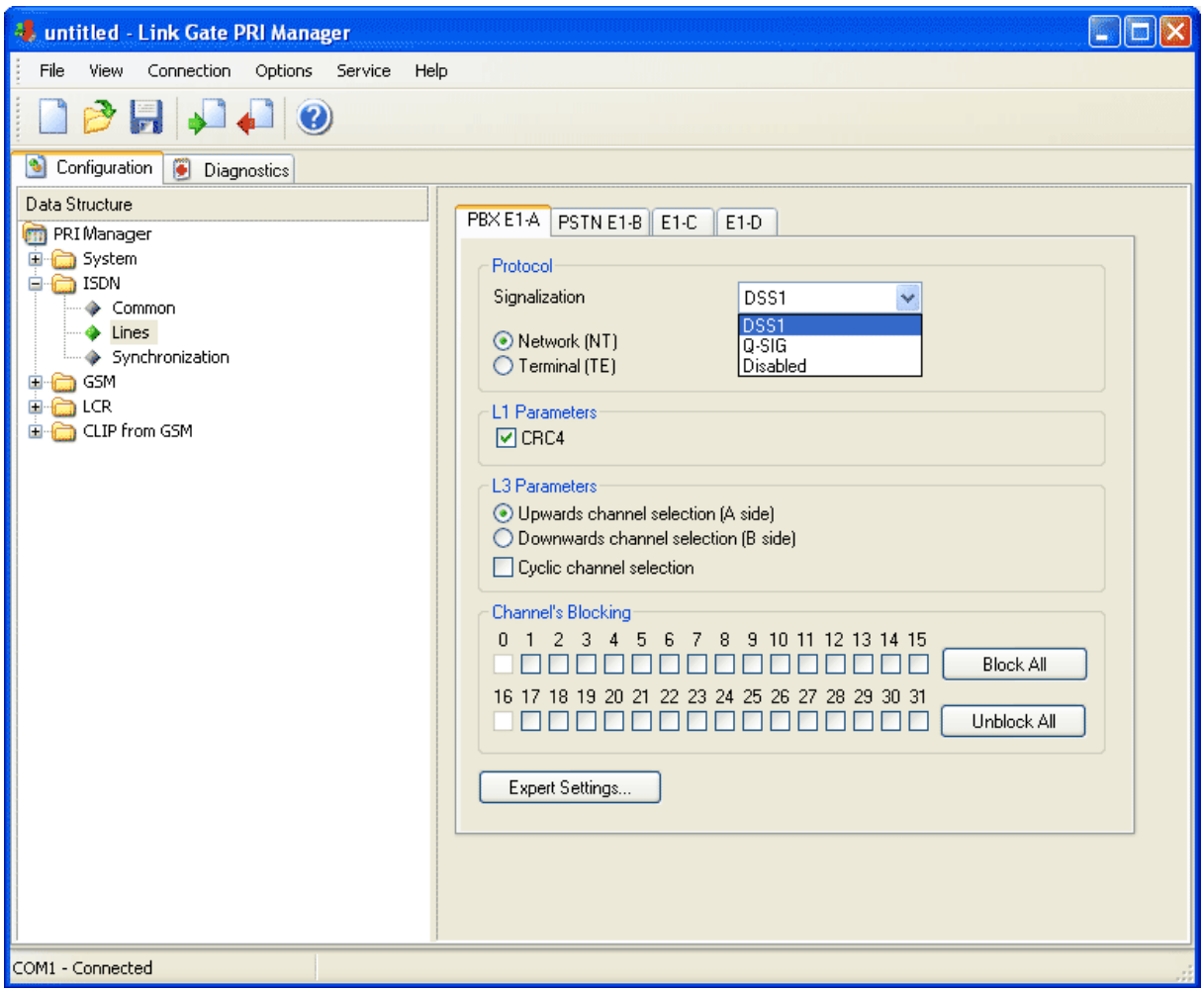
Time (in seconds) to wait for next digit. This timeout causes the end of dialing from PBX.

- **Time to save smart callback**

Time (in hours) for saving callback information in *Link Gate PRI* smart callback table. '0' means that smart callback function is disabled.

7.1.3 Lines

In this section you can set options for each line (PBXE1-A, PSTNE1-B, E1C, E1D).



Protocol

In this section you can set protocol.

- **Signalization**

You can define type of signalization: DSS1 (ITU-T Q.931), Q-SIG or disabled.
You can configure the line as **network (NT)** or **terminal (TE)**.

L1 Parameters

- **CRC4**

Parameter for activating/deactivating CRC of Layer 1 on PRI ISDN interface.

L3 Parameters

Defines way of occupation of B-channels on PRI interface.

- **Upwards channel selection (A side)**

Gateway will occupy channels from channel 1 to 32.

- **Downwards channel selection (B side)**

Gateway will occupy channels from channel 32 to 1.

- **Cyclic channel selection**

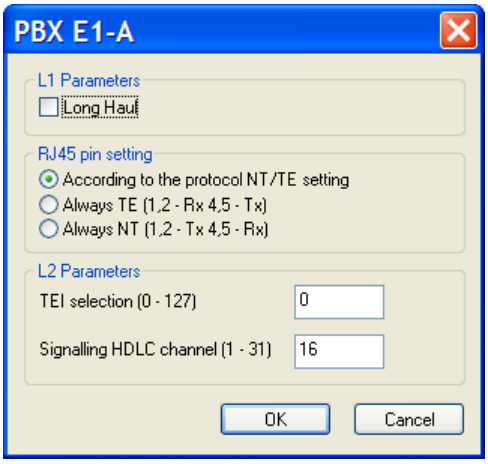
Gateway will occupy channels from last engaged +1/-1 channel.

Channel's Blocking

This setting allows to block unused channel.

Expert Settings

This pane contains other parameters of lines. This setting is not recommended to change.



- **L1 Parameters**

Parameters for L1 layer.

- **Long Haul**

This setting is not recommended to change (only the Gateway is placed far away from PBX approximately 300m and PBX takes part of it).

- **RJ45 pin setting**

You can choose from 3 options of RJ45 pin setting: According to the protocol, Always TE or Always NT.

- **L2 Parameters**

This setting is not recommended to change.

TEI selection (0-127)

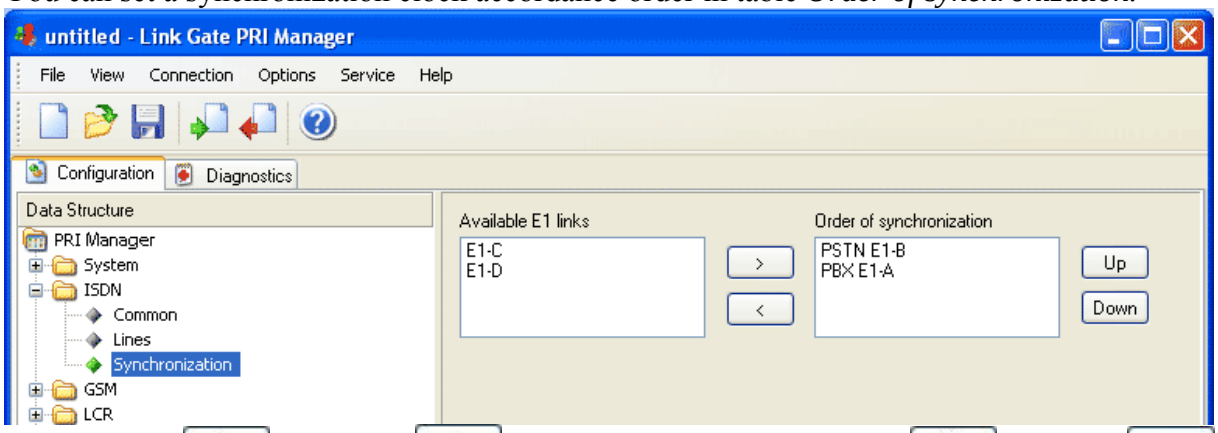
Gateway identification address (0 by default, 127 max.)

Signaling HDLC channel (1-31)

Gateway identifies HDLC channel (16 by default).

7.1.4 Synchronization

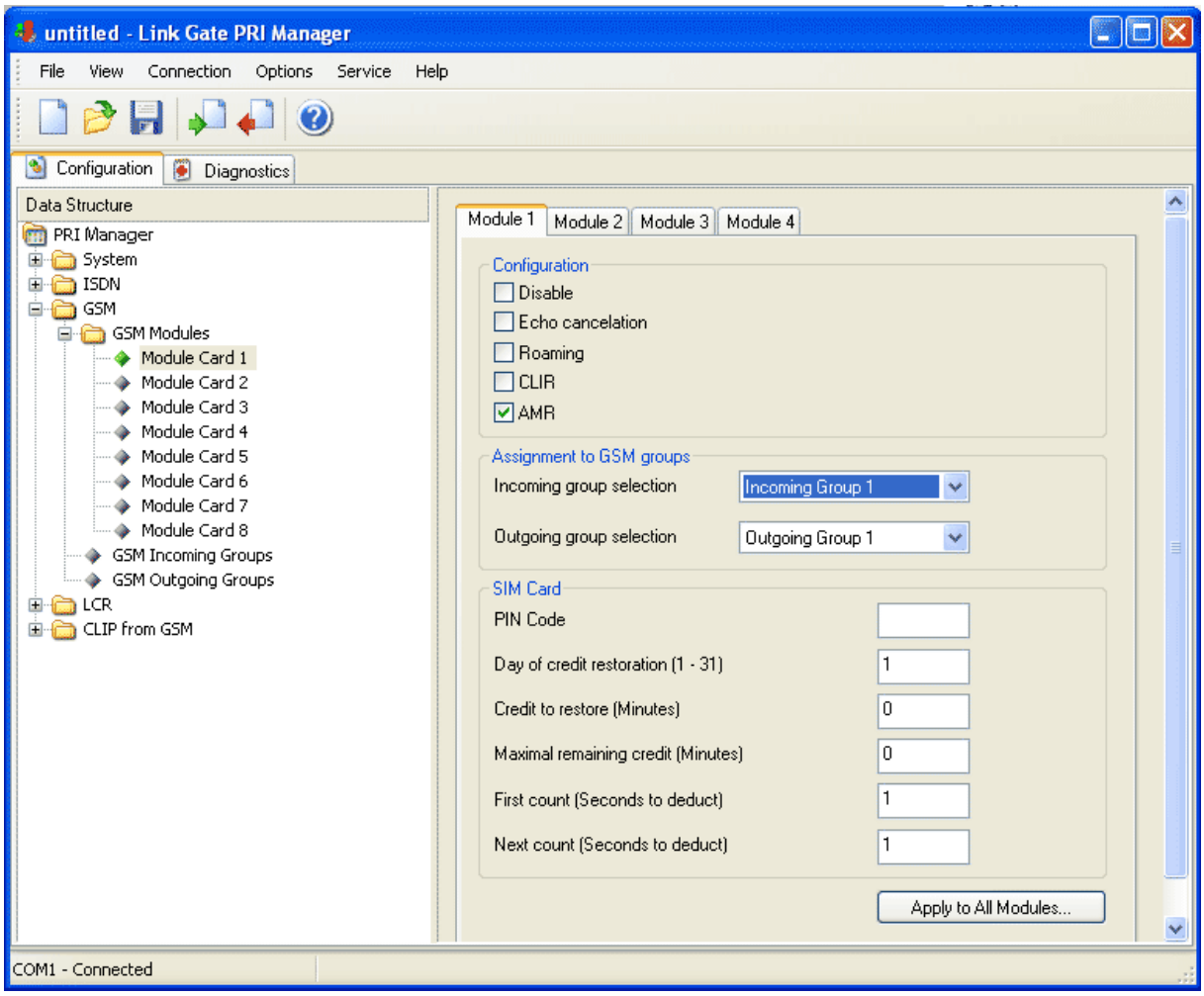
You can set a synchronization clock accordance order in table *Order of synchronization.*



You can add > or reduce < any of E1 links and move up Up or down Down their sequence. First line in the pane *Order of synchronization* has the highest priority.

7.2 GSM

This section defines properties for GSM modules. There are displayd 4 modules for each module card (max 4 modules x 8 card).



7.2.1 GSM Modules

Defines assignment GSM modules to GSM group and allows setting SIM card.

Assignment to GSM groups

It is possible to set each module (0-32) and assign its *GSM Incoming Group* and *GSM Outgoing Group*.

SIM card

In this window we can set:

- **PIN code**

Set number of PIN code for SIM card. Length of PIN code is 4.

- **Day of credit restoration (1-31)**

Set day of month when credit is automatic restoring.

- **Credit to restore**

Set amount of credit (in minutes), which is restoring.

- **Remaining credit**

Set amount of remaining minutes, which you do not spend, these will be rolled over to the next month and added to your credit.

- **First count (in seconds)**

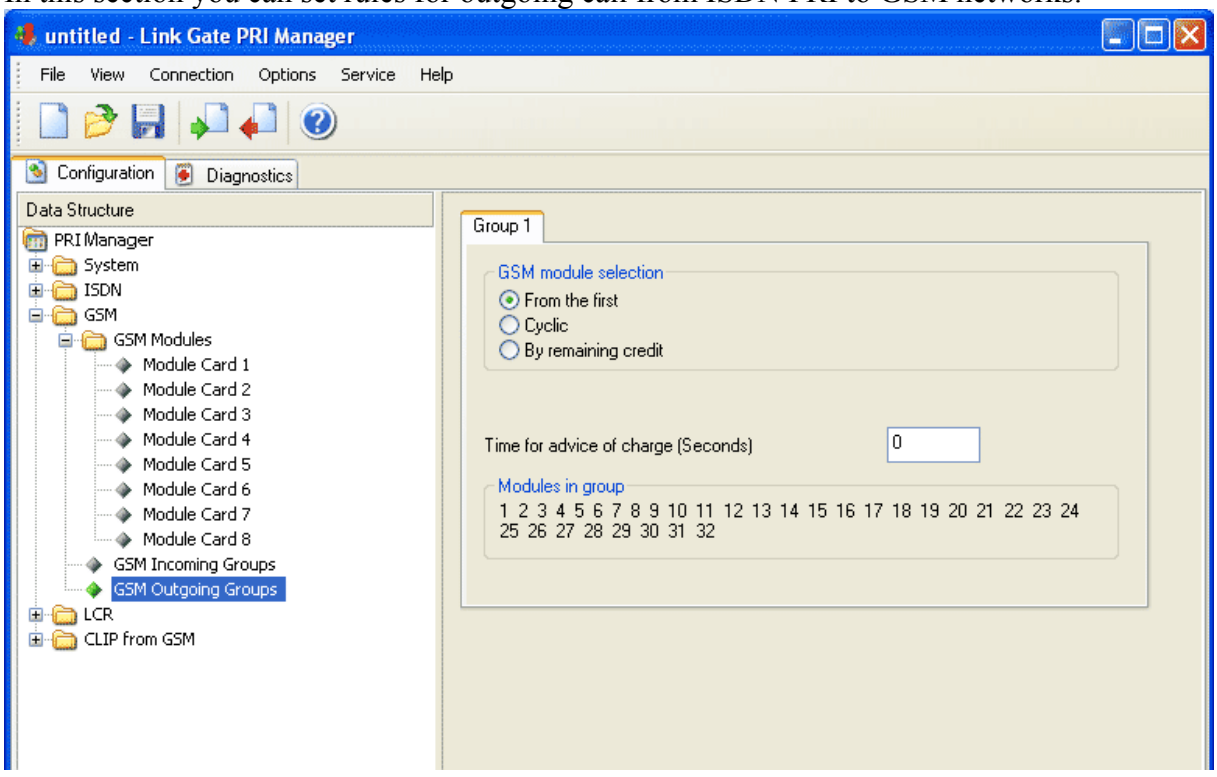
Length of the first period. After this timeout Gateway uses parameter “next count” to calculate the length of the call. (1 to 250 seconds).

- **Next count (in seconds)**

Length of the next period (1 to 250 seconds)
Parameters First count and Next count are used for account of the real length of the call from the view of GSM operator.
Example 1: If the call is charged per second - set both parameters to 1.
Example 2: If you are charged immediately after answering a call for the whole first minute and then second by second - set first count to 60 and next count to 1.
Proper setting of these parameters helps you to keep real record of the minutes spent and charged for each SIM.

7.2.2 GSM Outgoing Group

In this section you can set rules for outgoing call from ISDN PRI to GSM networks.



From the first

SIM card will be switched from the first to the last in its group.

Cyclic

SIM card will be switched from last engaged +1.

By remaining credit

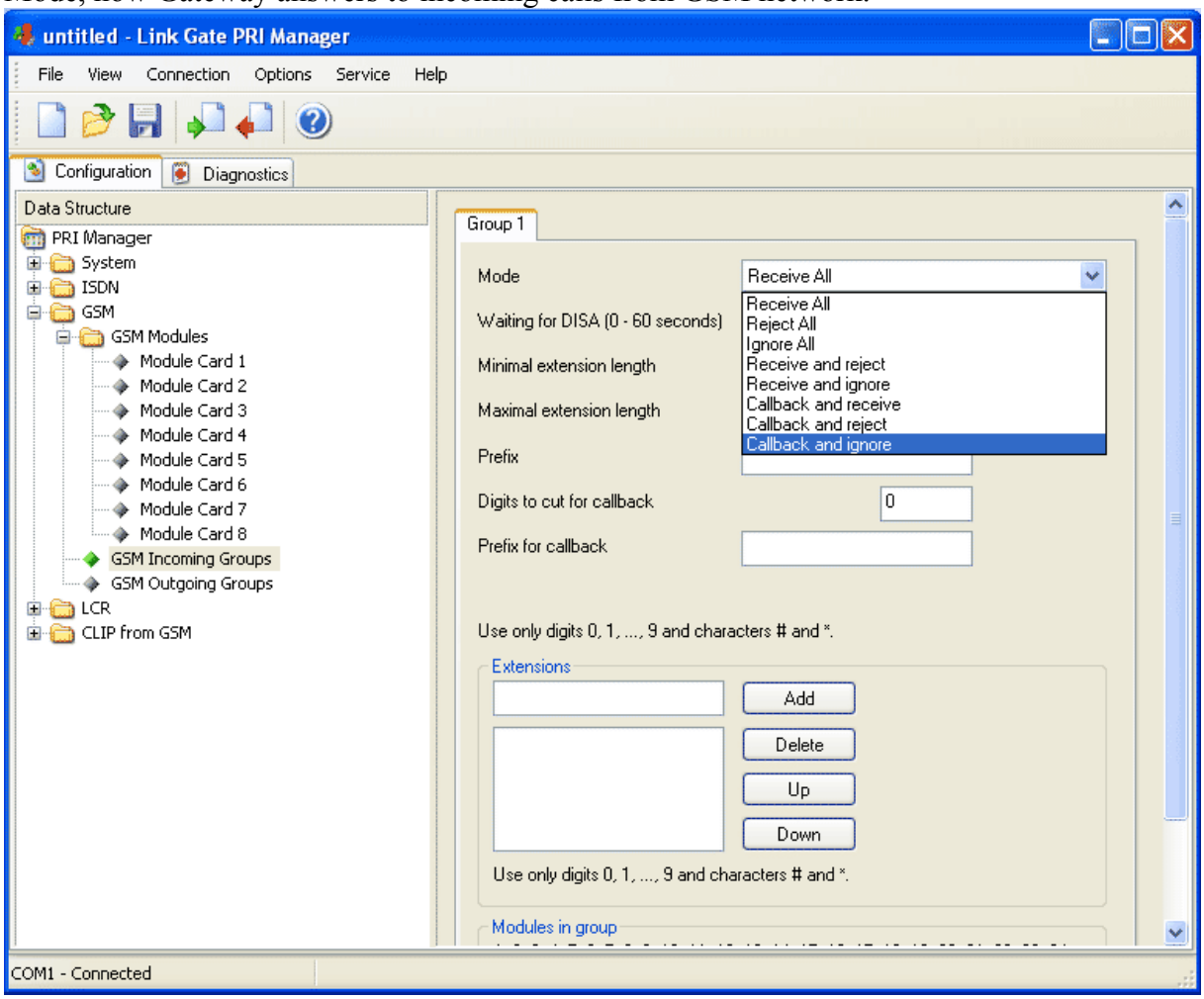
The gateway routes calls as in the cyclic mode but selects the GSM modules according to the least number of called minutes instead of cyclically.

7.2.3 GSM Incoming Group

In this section you can set rules for outgoing call from ISDN PRI to GSM networks.

Mode

Mode, how Gateway answers to incoming calls from GSM network.



- **Receive All**

All incoming calls will be routed to ISDN interface according to following parameters.

Reject All

By selecting this item you barring GSM incoming calls (the calling subscriber gets the busy tone).

- **Ignore All**

By selecting this item you ignore GSM incoming calls (but the calling subscriber gets the ringing tone).

- **Receive and reject**

By selecting this item you barring GSM incoming calls (the calling subscriber gets the busy tone) except calls, which CLIP are at list of GSM numbers (see section *List of GSM numbers*).

- **Receive and ignore**

By selecting this item you ignore GSM incoming calls (but the calling subscriber gets the ringing tone) except calls, which CLIP are at list of GSM numbers (see section *List of GSM numbers*).

- **Callback and receive**

You can activate callback (see section *List of GSM numbers*) in GSM incoming group which can use callback function, other calls will be routed to ISDN interface.

- **Callback and reject**

You can activate callback (see section *List of GSM numbers*) in GSM incoming group, which can use callback function, other calls will be rejected.

- **Callback and ignore**

You can activate callback (see section *List of GSM numbers*) in GSM incoming group, which can use callback function, other calls will be ignored.

Waiting for DISA (0 – 60 seconds)

This is interval how long gateway will wait for DISA (Direct Inward System Access). If there is 0, calls will be routed immediately to ISDN interface.

Minimal extension length

Minimum of DTMF digits in DTMF dial-in.

Maximal extension length

Maximum number of digits which be DTMF-dialed for incoming calls. After the last DTMF dialing, which is the maximum, an ISDN call is made automatically with the currently selected DISA (or DTMF prefix if necessary).

Prefix

Prefix, which the gateway adds before dialed DTMF numbers.

Extensions

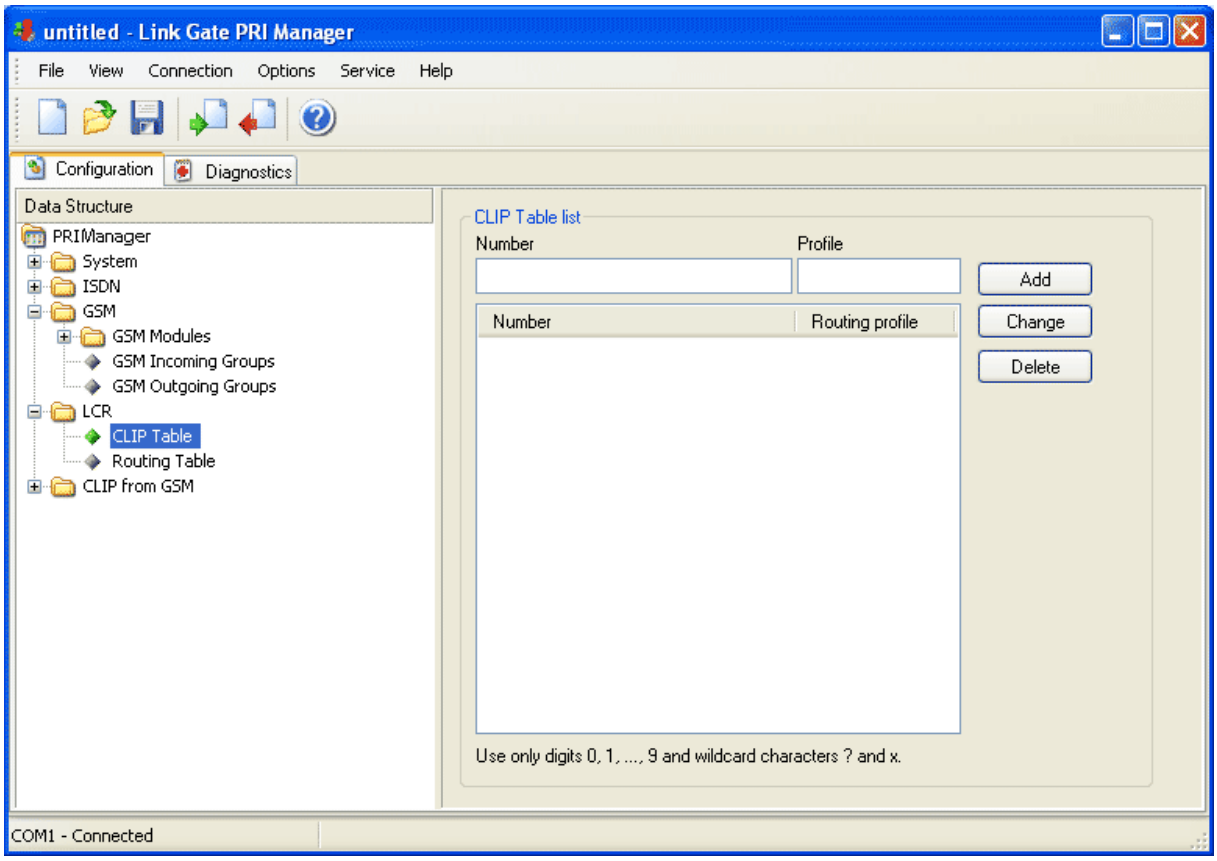
If the parameter *Waiting for DISA (0 – 60 seconds)* is setting in 0 or number of called digits is less then *Minimal extension length* call is routed to extension entered in this table (in order). Maximal count of this extension is 5 extensions.

7.3 LCR (Least Cost Routing)

A fully intelligent LCR function is the basic tool, allowing to route outgoing ISDN calls to GSM networks (or ISDN network) by the called number prefix, and calling party number and GSM module load in the particular group. L**east cost routing** (LCR) is the process that provides customers with cheap telephone calls. Each outgoing call from gateway interface will be routed to GSM network according to *CLIP Table* and. *Routing Table* Gateway at each call check line to line and in case that called prefix is same as prefix stored in *Routing Table* the call will be routed via defined GSM group(s) or via E1-B interface.

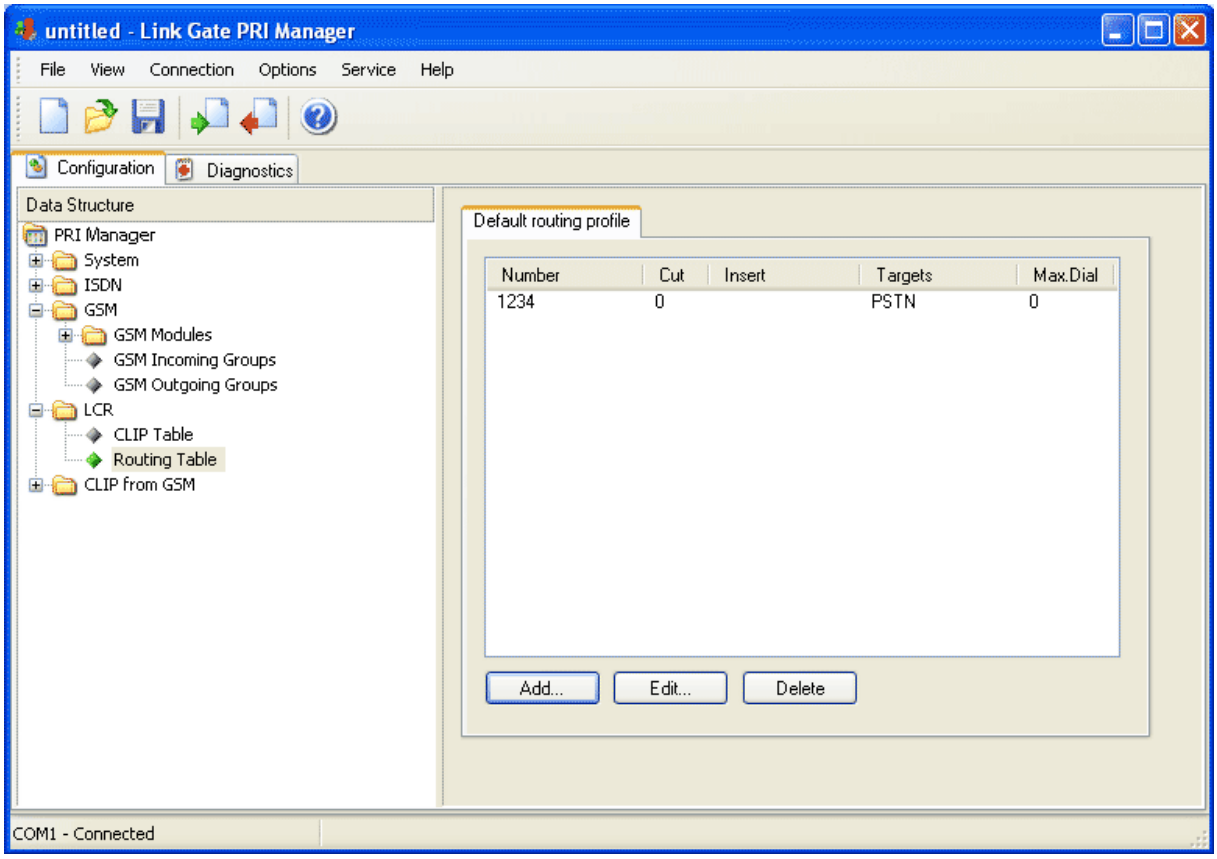
7.3.1 CLIP Table

The ***Link Gate PRI*** stores a list of telephone numbers that are known to be charged at far greater prices. In this table is possibe to create different *Routing profile* for sorted subscribers. Any calls of this type are not routed via *Default routing profile*, but via your own defined *Routing profile*.



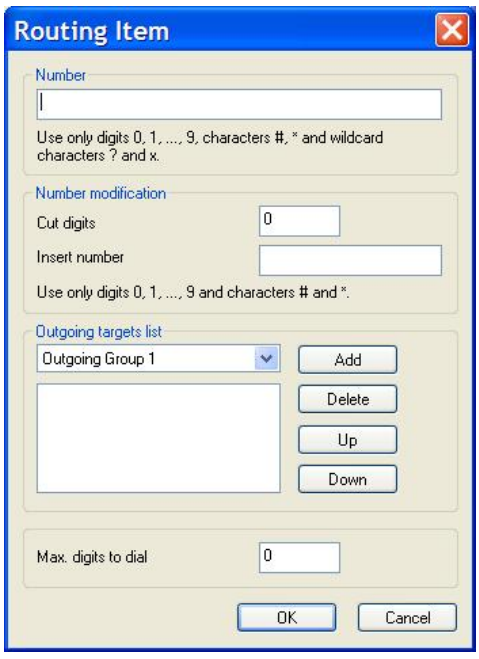
7.3.2 Routing Table

This is pane with Default routing profile and others routing profiles. You can Add, Edit or delete any items in this table.



Default routing profile

You can set all routing item *Number*, *Number modification* and *Outgoing targets list* by pressing button Add:



- **Number**

You can define digits of this routing.

- **Number modification**

You can define length of cut digits and digits for inserting before called number.

- **Outgoing targets list**

You can choose one or more outgoing GSM group(s) and add to this list. It is possible to choose also routing via PSTN at the end of listing group(s). It means that in case that call is not possible to make via any outgoing GSM groups from this list, call will be routed via PSTN (E1-B interface). Maximum number of outgoing targets is five.

- **Max. digits to dial**

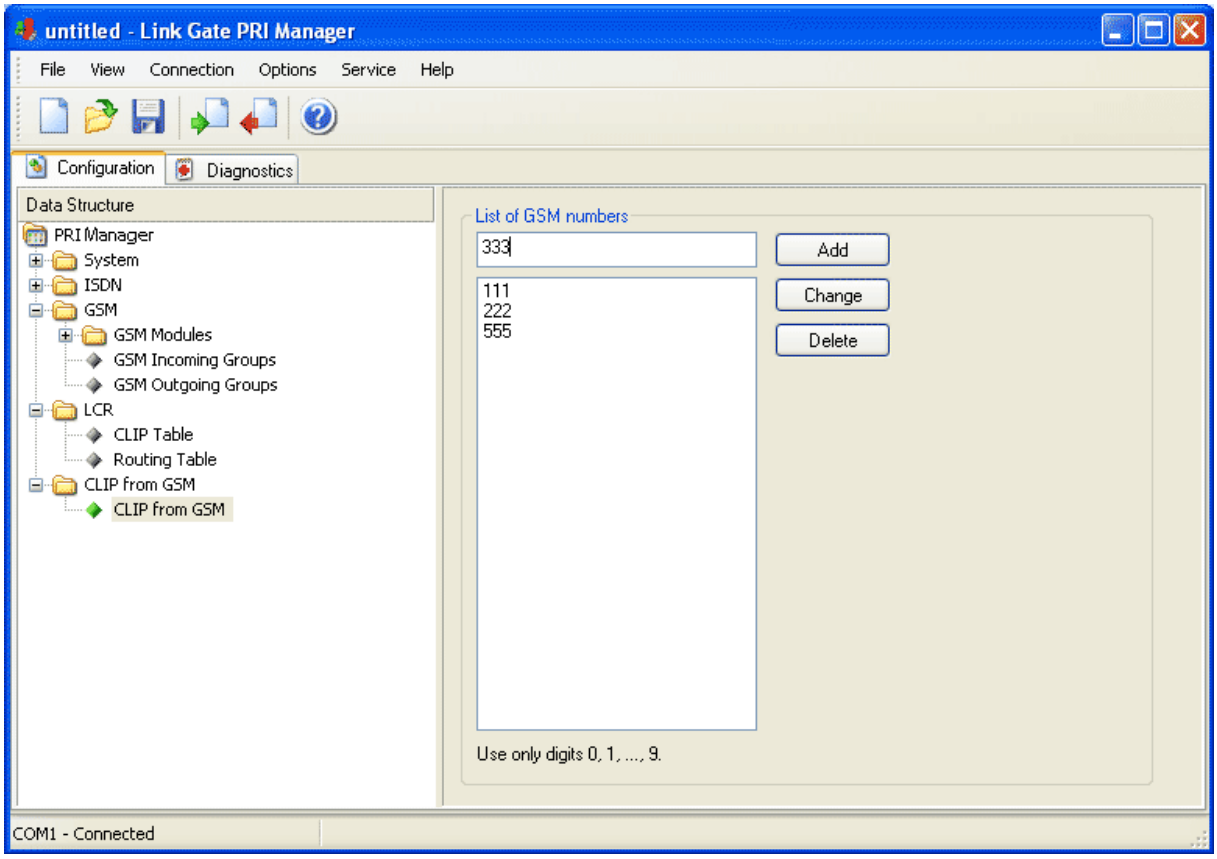
You can define length of digits, which will be sent. ‘0’ means that length of called number is unknow and end of dial is recognized after timeout defined in *Wait for dialing*. This parameter can make the call arrangement faster.

Routing profile

There is information about each routing profile (1-254) setting in *CLIP Table.* Parameters are the same as the *Default routing profile.*

7.4 CLIP from GSM

You can add, change or delete GSM numbers to *List of GSM numbers*.



List of GSM numbers

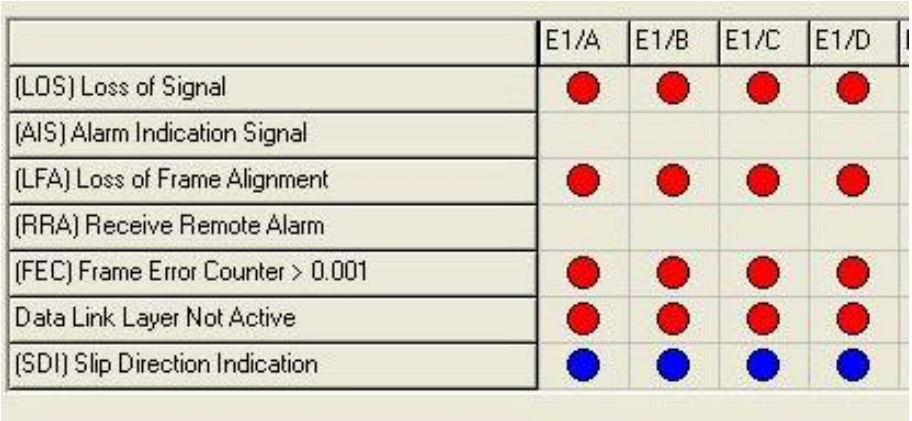
This is list of numbers using in *GSM Incoming Group.*

8 Diagnostics

In the bookmark of diagnostics you can see status of ISDN lines and GSM modules.

8.1 ISDN lines

This pane displays status of lines from E1 to E4.



Free space signalizes OK parameter of actual line.
Red indicator signalizes ERROR.
Bue indicator signalizes WARNING.

8.2 GSM modules

This pane displays status and credit of GSM modules.

Appendix

9 Technical Conditions for Installation

9.1 Subrack

Dimensions (W x H x D)	482 x 133 x 360 mm (19“ x 3U x 360 mm)
Weight (full configuration)	13.8 Kg
Power supply	110-120V AC , 220-240V AC/ 50-60Hz optional
Power input	max. 380VA

9.2 GSM

Mobile network type	GSM phase 2/2+
Transmission output per channel	900MHz / 2W, 1800MHz / 1W
VF connector	GSC RF connector 50 Ω GSM boards with Siemens TC35i

9.3 PRI Interface(s)

Interface	1-4 x ISDN PRI
Signaling	Q.931-EDSS1, Q-SIG
Type (NT or TE)	NT/TE
TEI number	0 – 63
Clock (master or slave)	Master/Slave
Connector	RJ 45
D channel timeslot	16

9.4 Temperature

Working temperature range	0°C to + 50°C
Relative humidity max.	95% at 40°C
Air – condition	optional

9.5 Remote Control Line types

Type of line	USB2.0 Ethernet10/100 BaseT